

What is claimed is:

1. An electro-chemical analysis device, comprising:
 - a means for holding a sample undergoing analyzation;
 - 5 at least one thermal sensor for sensing the temperature of the sample during analyzation and providing sensed temperature data;
 - at least one biosensor, formed proximate the thermal sensor and in thermal contact with the sample;
 - a means for providing radiation to the sample, wherein the at least one
 - 10 thermal sensor, the at least one biosensor, and the means for providing heat are three-dimensionally integrated in a single substrate platform;
 - electronics for transforming the sensed temperature data into an output measurement signal, the electronics formed as part of a feedback circuit, thereby providing for the maintenance of a preferred temperature of the
 - 15 sample.
2. An electro-chemical analysis device as claimed in claim 1 wherein the at least one thermal sensor and the at least one biosensor are formed having a spatial resolution of less than 10 microns.
- 20 3. An electro-chemical analysis device as claimed in claim 2 wherein the at least one thermal sensor has a temporal resolution of less than 10 milliseconds.

4. An electro-chemical analysis device as claimed in claim 3 wherein the electro-chemical analysis device has a volume resolution of less than 50 microliters.

5 5. An electro-chemical analysis device as claimed in claim 4 wherein the means for holding a sample undergoing analyzation is a bioreactor chamber.

10 6. An electro-chemical analysis device as claimed in claim 4 wherein the means for holding a sample undergoing analyzation is interfacial surface tension.

15 7. An electro-chemical analysis device as claimed in claim 4 wherein the sample is a biomolecular sample..

8. A biomolecular sample as claimed in claim 7 wherein the sample is a nucleic acid biomolecule, DNA, RNA or a protein

20 9. An electro-chemical analysis device as claimed in claim 4 wherein the at least one biosensor comprises an array of biological probes each of the biological probes characterized as including an electronically active electrode coated with a specific DNA probe.

10. An electro-chemical analysis device as claimed in claim 4 wherein the at least one thermal sensor is formed as one of a p-n junction, a thermistor, or a resistance temperature detector (RTD).

5 11. An electro-chemical analysis device as claimed in claim 4 wherein the means for providing radiation to the biomolecular sample includes generating radiant heat by one of a thermal reaction, a chemical reaction, a fluid, or magnetic induction, proximate the biomolecular sample to heat the sample.

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12. An electro-chemical analysis device, comprising:

a substrate platform;

a bioreactor chamber formed integral with the substrate platform, the bioreactor chamber characterized as providing for a chamber to hold a
15 biomolecular sample during analysis;

at least one thermal sensor formed in thermal contact with the bioreactor chamber and the biomolecular sample and integral with the substrate platform, the at least one thermal sensor characterized as providing for the sensing of a temperature of the biomolecular sample and having a
20 temporal resolution of less than 10 milliseconds, the at least one thermal sensor providing sensed temperature data and having a temperature resolution of less than 0.1 degree centigrade;

a plurality of biosensors, formed having a spatial resolution of less than ten microns to the at least one thermal sensor, wherein the plurality of

biosensors are formed integral with the substrate platform and in physical contact with the biomolecular sample;

a reference probe formed proximate the at least one biosensor and integral the substrate platform, the reference probe characterized as
 5 performing as an electro-chemical reference;

a means for providing radiation to the biomolecular sample formed integral with the substrate platform, and in thermal contact with the biomolecular sample; and

a means for the transforming the sensed temperature data into an
 10 output measurement electrical signal, the means for transforming the sensed temperature data formed as part of a feedback circuit with the means for providing heat to the biomolecular sample, thereby providing for the maintenance of a preferred temperature for the biomolecular sample.

15 13. An electro-chemical analysis device as claimed in claim 12 wherein each of the plurality of biological probes includes an electronically active electrode coated with a specific DNA probe.

20 14. An electro-chemical analysis device as claimed in claim 12 wherein the at least one thermal sensor is formed as one of a p-n junction, a thermistor, or a resistance temperature detector (RTD).

15. An electro-chemical analysis device as claimed in claim 12 wherein the means for providing radiation to the biomolecular sample includes

providing radiant heat, generated by a resistive film formed proximate the bioreactor chamber.

16. An electro-chemical analysis device as claimed in claim 12 wherein
 5 the means for providing radiation to the biomolecular sample includes providing for a chemical reaction proximate the bioreactor chamber, the chemical reaction generating radiant heat to heat the biomolecular sample.

17. An electro-chemical analysis device as claimed in claim 12 wherein
 10 the means for providing radiation to the biomolecular sample includes providing for magnetic induction of heat proximate the biocompatible to heat the biomolecular sample.

18. A method for monitoring a sample using an electro-chemical
 15 analysis device, comprising the steps of:

providing at least one thermal sensor having a temporal resolution of less than 10 milliseconds and at least one biosensor three-dimensionally related on a substrate platform, the at least one thermal sensor and the at least one biosensor positioned having a spatial resolution of less than 10
 20 microns;

providing for a bioreactor chamber integrated with the substrate platform, and formed proximate the at least one biosensor, the bioreactor chamber characterized as holding a biomolecular sample for testing;

providing a means for providing radiation to the biomolecular sample
 25 formed integral the substrate platform;

introducing a biomolecular sample into the bioreactor chamber, the biomolecular sample characterized as being in thermal contact with the at least one thermal sensor and in physical contact with the at least one biosensor, the biomolecular sample having a temperature;

5 probing and detecting the temperature of the biomolecular sample with the thermal sensor;

generating an output measurement electrical signal from the sensed temperature;

10 processing the output measurement signal to submit a response signal to activate the means for providing radiation.

19. A method for monitoring a biomolecular sample using an electro-chemical analysis device as claimed in claim 18 wherein the step of providing at least one thermal sensor includes providing one of a p-n junction, a
15 thermistor, or a resistor temperature detector (RTD).

20. A method for monitoring a biomolecular sample using an electro-chemical analysis device as claimed in claim 18 wherein the step of providing at least one biosensor includes providing a plurality of biological probes each
20 of the plurality of biological probes characterized as including an electronically active electrode coated with a specific DNA probe.

21. A method for monitoring a biomolecular sample using an electro-chemical analysis device as claimed in claim 18 wherein the step of providing
25 a means for providing radiation to the biomolecular sample includes providing

radiant heat generated by one of a resistive film formed proximate the bioreactor chamber, a chemical reaction proximate the bioreactor chamber, or magnetic induction of heat proximate the bioreactor chamber to heat the biomolecular sample.

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